

CLAIMS

1. A motion control apparatus comprising:
a pressing member pressing a fluid; and
a fluid control mechanism controlling a movement of the fluid pressed by said pressing member;
said fluid control mechanism closing a first flow path through which the fluid pressed by said pressing member passes by a valve body so as to block the fluid from moving, in the case where an external force applied to a movable body as a controlled object in a motion stop state is equal to or less than a predetermined value, opening said first flow path so as to allow the movement of the fluid, in the case where the external force applied to said movable body goes over the predetermined value, and opening said first flow path so as to be capable of continuing the movement of the fluid even if the external force is reduced to be equal to or less than the predetermined value, after the movement of the fluid is started;
said motion control apparatus being capable of holding the motion stop state of said movable body by utilizing a resistance of the fluid generated by said pressing member pressing the fluid, and being capable of continuing the motion of said movable body by a smaller external force than that at a time of starting the motion, by means of said fluid control mechanism, after the movement of said movable body is started,
wherein said pressing member presses the fluid due to a rotational motion.
2. A motion control apparatus as claimed in claim 1, further comprising a seal member sealing a gap formed between a movable member including said pressing member and a non-movable member, and preventing the fluid from moving through said gap.
3. A motion control apparatus as claimed in claim 1 or 2, further comprising a shaft to which the external force applied to said movable body is transmitted, wherein said shaft is provided with a second flow path through which the fluid passes.

4. A motion control apparatus as claimed in any one of claims 1 to 3, wherein said fluid control mechanism is provided in said pressing member.
5. A motion control apparatus as claimed in any one of claims 1 to 3, further comprising a shaft to which the external force applied to said movable body is transmitted, wherein said shaft is provided with said fluid control mechanism.
6. A motion control apparatus as claimed in any one of claims 1 to 3, wherein said fluid control mechanism is provided in a bottom wall of a chamber in which said pressing member is accommodated.
7. A motion control apparatus as claimed in any one of claims 1 to 6, further comprising a delay mechanism delaying a closing motion of a valve body constituting said fluid control mechanism.
8. A motion control apparatus as claimed in any one of claims 1 to 7, further comprising:
 - a third flow path through which the fluid is allowed to pass;
 - a valve mechanism closing said third flow path by the valve body so as to block the movement of the fluid, in the case where the external force applied to said movable body in the motion stop state is less than a predetermined value, and opening said third flow path so as to allow the movement of the fluid, in the case where the external force applied to said movable body reaches the predetermined value; and
 - a fourth flow path through which the fluid passing through said third flow path is allowed to pass,wherein a resistance of the fluid is generated by throttling a flow volume of the fluid moving through said fourth flow path by said fourth flow path.
9. A motion control apparatus as claimed in any one of claims 1 to 7, further

comprising:

a fifth flow path through which the fluid is allowed to pass; and

a valve mechanism closing said fifth flow path by the valve body so as to block the movement of the fluid, in the case where the external force applied to said movable body in the motion stop state is less than a predetermined value, and opening said fifth flow path so as to allow the movement of the fluid, in the case where the external force applied to said movable body reaches the predetermined value,

wherein a resistance of the fluid is generated by throttling a flow volume of the fluid moving through said fifth flow path by said fifth flow path.

10. A motion control apparatus as claimed in any one of claims 1 to 9, further comprising a sixth flow path capable of making the fluid passing through said first flow path flow into a chamber in which an internal pressure is reduced due to a rotating motion of said pressing member, wherein said sixth flow path is structured such as to be allowed to pass the fluid therethrough without throttling a flow volume of the fluid.

11. A motion control apparatus as claimed in any one of claims 1 to 10, further comprising a seventh flow path capable of reducing a resistance of the fluid generated by being pressed by said pressing member in a part of an angular range at which said pressing member is allowed to move.

12. A door of a motor vehicle comprising:

a motion control apparatus built in a door main body; and

a transmission member transmitting an external force applied to the door main body to said motion control apparatus,

wherein said motion control apparatus comprises:

a shaft to which the external force applied to the door main body is transmitted via said transmission member;

a pressing member executing a rotating motion in accordance with a rotation of said shaft and pressing a fluid; and

a fluid control mechanism controlling a movement of the fluid pressed by said pressing member,

wherein said fluid control mechanism closes a first flow path through which the fluid pressed by said pressing member passes by a valve body so as to block the fluid from moving, in the case where an external force applied to a movable body as a controlled object in a motion stop state is equal to or less than a predetermined value, opens said first flow path so as to allow the movement of the fluid, in the case where the external force applied to said movable body goes over the predetermined value, opens said first flow path so as to be capable of continuing the movement of the fluid even if the external force is reduced to be equal to or less than the predetermined value, after the movement of the fluid is started;

wherein said motion control apparatus is capable of holding the motion stop state of said movable body by utilizing a resistance of the fluid generated by said pressing member pressing the fluid, and is allowed to continue the motion of said movable body by a smaller external force than that at a time of starting the motion, by means of said fluid control mechanism, after the movement of said movable body is started.

13. A door of a motor vehicle as claimed in claim 12, wherein said motion control apparatus is provided with a seal member sealing a gap formed between a movable member including said pressing member and a non-movable member, and preventing the fluid from moving through said gap.

14. A door of a motor vehicle as claimed in claim 12 or 13, wherein a shaft of said motion control apparatus is provided with a second flow path through which the fluid is allowed to pass.

15. A door of a motor vehicle as claimed in claim 12 or 13, wherein said fluid control mechanism is provided in the pressing member of said motion control apparatus.

16. A door of a motor vehicle as claimed in claim 12 or 13, wherein said fluid control mechanism is provided in the shaft of said motion control apparatus.

17. A door of a motor vehicle as claimed in claim 12 or 13, wherein said fluid control mechanism is provided in a bottom wall of a chamber in which the pressing member of said motion control apparatus is accommodated.

18. A door of a motor vehicle as claimed in any one of claims 12 to 17, wherein said motion control apparatus is provided with a delay mechanism delaying a closing motion of a valve body constituting said fluid control mechanism.

19. A door of a motor vehicle as claimed in any one of claims 12 to 18, wherein said motion control apparatus comprises:

a third flow path through which the fluid is allowed to pass;

a valve mechanism closing said third flow path by the valve body so as to block the movement of the fluid, in the case where the external force applied to said movable body in the motion stop state is less than a predetermined value, and opening said third flow path so as to allow the movement of the fluid, in the case where the external force applied to said movable body reaches the predetermined value; and

a fourth flow path through which the fluid passing through said third flow path is allowed to pass,

wherein a resistance of the fluid is generated by throttling a flow volume of the fluid moving through said fourth flow path by said fourth flow path.

20. A door of a motor vehicle as claimed in any one of claims 12 to 18, wherein said motion control apparatus comprises:

a fifth flow path through which the fluid is allowed to pass; and

a valve mechanism closing said fifth flow path by the valve body so as to block the movement of the fluid, in the case where the external force applied to said movable body in the motion stop state is less than a predetermined value, and opening said fifth

flow path so as to allow the movement of the fluid, in the case where the external force applied to said movable body reaches the predetermined value,

wherein a resistance of the fluid is generated by throttling a flow volume of the fluid moving through said fifth flow path by said fifth flow path.

21. A door of a motor vehicle as claimed in any one of claims 12 to 20, wherein said motion control apparatus is provided with a sixth flow path capable of making the fluid passing through said first flow path flow into a chamber in which an internal pressure is reduced due to a rotating motion of said pressing member, and said sixth flow path is structured such as to be allowed to pass the fluid therethrough without throttling a flow volume of the fluid.

22. A door of a motor vehicle as claimed in any one of claims 12 to 21, wherein said transmission member is structured such as to have a first arm coupled to a vehicle body and oscillating around the coupling portion, and a second arm coupled to said first arm in one end and fixed to a shaft of said motion control apparatus in the other end.

23. A door of a motor vehicle as claimed in any one of claims 12 to 21, wherein said transmission member is structured such as to have a first gear fixed to a vehicle body, and a second gear fixed to a shaft of said motion control apparatus for engaging with said first gear.

24. A door of a motor vehicle as claimed in claim 23, wherein the engagement between said first gear and the second gear is canceled in a part of an angular range at which the door main body is allowed to move.

25. A door of a motor vehicle as claimed in any one of claims 12 to 23, wherein said motion control apparatus is provided with a seventh flow path capable of reducing a resistance of the fluid generated by being pressed by said pressing member in a part of an angular range at which said pressing member is allowed to move.